Solutions
College Alg. Review

Name ____________________

Date ____________________

Solving Equations

1) $|2k-3| = |5k+4|$

$2k-3 = 5k+4$ or $2k-3 = -5k+{}^-4$

$-3k-3 = 4$ $\quad$ $7k-3 = -4$

$-3k = 7$ $\quad$ $7k = 1$

$k = \frac{-7}{3}$ $\quad$ $k = \frac{1}{7}$

$k = \left\{ \frac{-7}{3}, \frac{1}{7} \right\}$

2) $m = \frac{kx^2}{y}$

$12 = \frac{k(6)^2}{4}$ $\quad$ $m = \frac{\frac{4}{3}(4)^2}{10}$

$12 = \frac{36k}{4}$ $\quad$ $m = \frac{\left(\frac{4}{3}\right)16}{10}$

$12 = 9k$

$k = \frac{4}{3}$ $\quad$ $m = \frac{64}{3} \cdot \frac{1}{10}$

$m = \frac{64}{30} = \frac{32}{15}$

3) $y = k\,p^2q^4$

$y = k\,(2p)^2(3q)^4$

$k\,(4p^2)(81q^4)$

$324(kp^2q^4)$

$324 \cdot y$

324 time larger

Solving Inequalities

1) $-4 < 3x-7 \leq 3$
$\quad +7 \quad +7 \quad +7$

$\frac{3}{3} < \frac{3x}{3} \leq \frac{10}{3}$

$1 < x \leq \frac{10}{3}$

$\left(1, \frac{10}{3}\right]$

2) $|4x+3| > -2$

$4x+3 > -2$ or $4x+3 < 2$

$4x > -5$ $\quad$ $4x < -1$

$x > \frac{-5}{4}$ or $x < \frac{-1}{4}$

$(-\infty, \infty)$

3) $2x^2+5x-1 > 2$

$2x^2+5x-3 > 0$

$(2x-1)(x+3) > 0$

$x = \frac{1}{2}$ $\quad$ $x = -3$

$+ \quad | \quad - \quad | \quad +$ (number line marked at -3 and $\frac{1}{2}$)

$(2x-1)$	$-$	$-$	$+$
$(x+3)$	$-$	$+$	$+$

$(-\infty, -3) \cup \left(\frac{1}{2}, \infty\right)$

4) $\frac{x+1}{x-3} \leq 2$

$\frac{x+1}{x-3} - 2 \leq 0$

$\frac{x+1}{x-3} + \frac{-2(x-3)}{x-3} \leq 0$

$\frac{x+1+-2x+6}{x-3} \leq 0$

$\frac{-1x+7}{x-3} \leq 0$

$x-3=0$ $\quad$ $-1x+7=0$

$x=3$ $\quad$ $x=7$

$- \quad | \quad + \quad | \quad -$ (number line marked at 3 and 7)

$(-\infty, 3) \cup [7, \infty)$

Algebra of functions

1) $f(x) = |2x-3|$, $g(x) = x^2+4$

$(f+g)(-1) = f(-1) + g(-1) = 5 + 5 = 10$

2) $f(-1) = (-1)^2+3 = 4$

3) $f(-.5) = [-.5] - |-.5| = -1 + .5 = -1.5$

4) $f(x) = 4x+1 \quad g(x) = 2x^2-8x$

$f(g(x)) = 4(2x^2-8x)+1$

$= 8x^2-32x+1$

5) $D = (-\infty,-2) \cup (-2,\infty)$

6) $R = [1,\infty)$

7) $f(x) = \sqrt{2x^2-x}$

$2x^2-x \geq 0$

$x(2x-1) \geq 0$

$x=0 \quad x=\frac{1}{2}$

$+ \quad - \quad +$

$0 \quad \frac{1}{2}$

$(-\infty,0] \cup [\frac{1}{2},\infty)$

8) $f(x) = \sqrt{\frac{2}{5-x^2}}$

$\frac{2}{5-x^2} \geq 0$

$-x^2+5=0$

$-x^2=-5$

$\sqrt{x^2} = \sqrt{5}$

$x = \pm\sqrt{5}$

$- \quad + \quad -$

$-\sqrt{5} \quad \sqrt{5}$

$[-\sqrt{5}, \sqrt{5}]$

9) $g(x) = |x-2|-3$

10) $f \circ g(5) = 95$ $\quad g(5) = 2(5)+1 = 11$

$f(11) = (11)^2-2(11)-4$

$= 121-22-4$

$= 95$

11) $y = 3x+1$

$x = 3y+1$

$-3y = -x+1$

$\boxed{y = \frac{1}{3}x + \frac{-1}{3}}$

12) passes horizontal line test

or

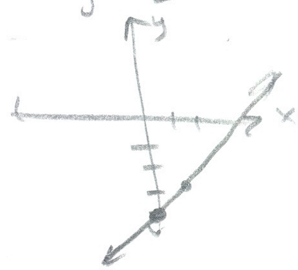
Solve for x, has only one solution

Linear function

1) $x-2y=8$

$-2y = -x+8$

$y = \frac{1}{2}x + -4$



2) $x+5y=13$

$5y = -x+13$

$y = \frac{-1}{5}x + \frac{13}{5}$

$m = \frac{-1}{5}$

3) parallel to $y=3x-1$

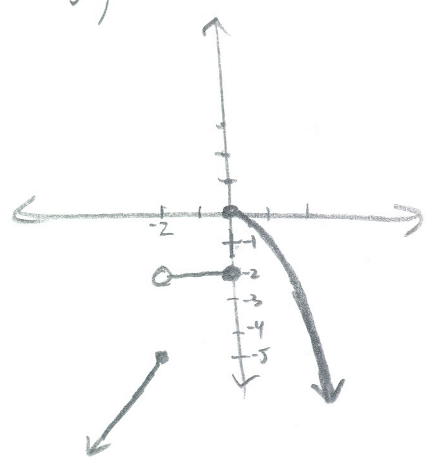
$\therefore m=3 \quad f(-1)=7 \therefore (-1,7)$ is a point

$y-7 = 3(x- -1)$

$y = 3x+10$

4) $X = -4$

5)



Quadratic Functions

1) $y=x^2$ $\quad -y=x^2 \quad -y=(-x)^2$

$y=(-x)^2 \quad y=-x^2 \quad y=-x^2$

$y=x^2$ $\quad$ not symmetric to x-axis $\quad$ not symmetric to origin (even)

Symmetric to y-axis (odd)

2) $y=3x^2-2x+5$

$x=\frac{-b}{2a}=\frac{2}{2(3)}=\frac{2}{6}=\frac{1}{3}$ axis

$f(\frac{1}{3})=3(\frac{1}{3})^2-2(\frac{1}{3})+5$

$=\frac{1}{3}-\frac{2}{3}+\frac{15}{3}=\frac{14}{3}$

$(\frac{1}{3},\frac{14}{3})$ vertex

3) $h(t)=60t-16t^2$

$t=\frac{-b}{2a}=\frac{-60}{2(-16)}=\frac{60}{32}=\frac{15}{8}=1.875$

$h(1.875)=60(1.875)-16(1.875)^2$

$=112.5-56.25=\underline{56.25\text{ ft}}$

4) $y=(x-5)^2-3$

$y=a(x-h)^2+k$ $\quad (h,k)$ vertex

$\underline{(5,-3)}$

5) B

Polynomial functions

1) $f(2)=(2)^3-7(2)^2+1$

$8-28+1=-19$

2)

3	3	-7	2	3
		9	6	24
	3	2	8	27

$c>0$ and the bottom row is a positive $\therefore f(x)$ has no root greater than 3

3) $f(x)=x^4+x^3+5x^2-2x+7$

2 sign changes

$\therefore$ 2 or 0 pos. real zeros

$f(-x)=x^4-x^3+5x^2+2x+7$

2 sign changes

$\therefore$ 2 or 0 neg. real zeros

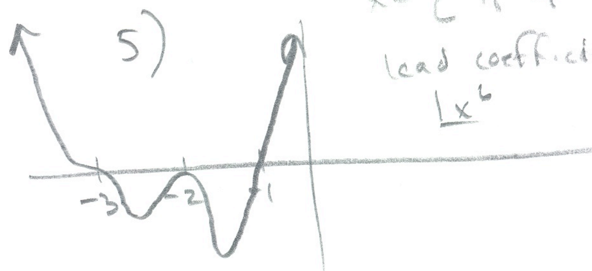
4, 2, 0 complex zeros

4) $f(x)=x^3+3x^2-2x-6$

	1	3	-2	-6
-1	1	2	-4	-2
-2	1	1	-4	2
-1.5	1	1.5	-4.25	-.375
-1.6	1	1.4	-4.24	.784
-1.55	1	1.45	-4.2475	.5836

≈ 1.5

5)



$x=\{-1,-2,-3\}$

lead coefficient

$1x^6$

6) $15=\pm1, \pm3, \pm5, \pm15$

$2=\pm1, \pm2$

$\pm1, \pm3, \pm5, \pm15, \pm\frac{1}{2}, \pm\frac{3}{2}, \pm\frac{5}{2}, \pm\frac{15}{2}$

7)

1	4	-8	0	7	4
		4	-4	-4	3
	4	-4	-4	3	7

No

8) $a(x-2)(x-3i)(x+3i)$

$a(x-2)(x^2+9)$

$f(x) = a(x^3 + -2x^2 + 9x - 18)$

$f(1) = a((1)^3 + -2(1)^2 + 9(1) - 18) = -20$

$a(1 + -2 + 9 - 18) = -20$

$10a = -20$

$a = -2$

$f(x) = -2(x^3 + -2x^2 + 9x - 18)$

$f(x) = -2x^3 + 4x^2 + -18x + 36$

9) $[x-(1-2i)][x-(1+2i)]$

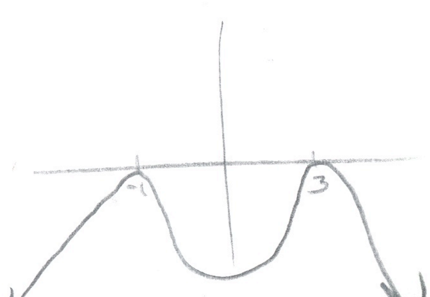
$x^2 - 2x + 5$

$$\begin{array}{r} x^2 - x - 6 \\ x^2-2x+5 \,\overline{)\, x^4 - 3x^3 + 1x^2 + 7x - 30} \\ + \; -x^4 + 2x^3 + -5x^2 \\ \hline -x^3 + -4x^2 + 7x \\ + \; +x^3 + -2x^2 + 5x \\ \hline -6x^2 + 12x - 30 \\ + \; +6x^2 + -12x + 30 \\ \hline 0 \end{array}$$

$x^2 - x - 6$

$(x-3)(x+2)$ ∴ zeros are $\{1-2i, 1+2i, 3, -2\}$

10) $f(x) = -(x-3)^2(x+1)^2$



Rational functions

1) $f(x) = \dfrac{2x^2+5x+3}{x^2-6x+8}$

$x^2 - 6x + 8 = 0$

$(x-4)(x-2) = 0$

$x = 4 \quad x = 2$

2) $f(x) = \dfrac{2 + \frac{5}{x} + \frac{3}{x^2}}{1 - \frac{6}{x} + \frac{8}{x^2}}$

$\frac{2}{1} = 2 =$

$y = 2$

3) when the degree of the polynomial function is larger than its numerator

$f(x) = \dfrac{x}{x^3+2}$

4) $f(0) = \dfrac{2(0)^2 + 5(0) + 3}{(0)^2 - 6(0) + 8}$

$f(0) = \frac{3}{8}$

$(0, \frac{3}{8})$